



A Solution-Finding Report

Title: *Gender differences*

Date: April 30, 2014

This solution-finding report provides information requested by the Chief Academic Officer for the Maine Department of Education, for resources related to “research related to gender differences, learning styles and interventions.”

The citations below can be classified into four groups according to the cause of the difference: biologically based and inherent cognitive differences, economic status, behavioral differences, and general societal and instructional biases in the classroom. Because these citations find a variety of causes of gender-based learning differences, their recommendations for addressing the differences are equally various. Moreover, although the debate is ongoing, some studies find that “gender differences in learning styles are small on average.” The most recent and comprehensive study of gender differences is the meta-analysis by Voyner and Voyner (2014, April 30).

Solution-finding Reports are intended to provide a quick response to the request for information; they are not intended to be a definitive literature survey or synthesis of the topic.

Bae, Y., Choy, S., Geddes, C., Sable, J., & Snyder, T. (2000). *Trends in educational equity for girls and women*. NCES 2000-030. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

<http://nces.ed.gov/pubs2000/2000030.pdf>

Congress requested the Secretary of Education to prepare a report on the status of educational equity for girls and women in the United States. This statistical report responds to that request by assembling a series of indicators that examine the extent to which males and females have access to the same educational opportunities, avail themselves of these opportunities, perform at the same level, succeed at the same rate, and obtain the same benefits.

Buchmann, C., DiPrete, T. A., & McDaniel, A. (2008). Gender inequalities in education. *Annual Review of Sociology*, 34: 319–337.

<https://academiccommons.columbia.edu/catalog/ac%3A129025>

This paper reviews the empirical research and theoretical perspectives on gender inequalities in educational performance and attainment from early childhood to young adulthood. Much of the literature on children and adolescents attends to performance differences between girls and boys. Of course achievement in elementary and secondary school is linked to the level of education one ultimately attains, including high school completion, enrollment in postsecondary education, college completion, and graduate and professional school experiences. The authors recommend three directions for future research: (a) interdisciplinary efforts to understand gender differences in cognitive development and non-cognitive abilities in early childhood, (b) research on the structure and practices of schooling, and (c) analyses of the intersectionality of gender with race, ethnicity, class, and immigrant statuses in creating complex patterns of inequalities in educational experiences and outcomes.

Chapman, A. (2002). Gender bias in education. *Multicultural Pavilion*.

<http://www.edchange.org/multicultural/papers/genderbias.html>

This article states that “discrepancies between the performance of girls and the performance of boys in elementary education lead some critics to argue that boys are being neglected within the education system.”

Coenen, J., & Van Klaveren, C. (2013). Better test scores with a same-gender teacher? Tier Working Paper Series, Tier Working Paper 13/03.

<http://www.svt.ntnu.no/iso/Marianne.Haraldsvik/Workshop2013/Papers2013/coenen.pdf>

This study examines if children’s math test scores are higher if they are taught by a teacher of their own gender.

Coniglio, R. (2013). Why gender matters in differentiating instruction. *TeachHub.com*.

<http://www.teachhub.com/why-gender-matters-differentiating-instruction>

This article begins, “With so much talk in education about differentiation and closing the achievement gap there has been a topic that has not gotten as much attention as I think it should. That topic is Gender Brain Difference and its impact on instruction in the classroom.”

Conlin, M. (2003, May 26). The new gender gap. *Business Week Online*.

www.businessweek.com/magazine/content/03_21/b3834001_mz001.htm

According to this article, “It may still be a man’s world. But it is no longer, in any way, a boy’s. From his first days in school, an average boy is already developmentally two years behind the girls in reading and writing. Yet he’s often expected to learn the same things in the same way in the same amount of time. While every nerve in his body tells him to run, he has to sit still and listen for almost eight hours a day. Biologically, he needs about four recesses a day, but he’s lucky if he gets one, since some lawsuit-leery schools have banned them altogether.”

Cornwell, C. M., Mustard, D. B., & Van Parys, J. (2012). Non-cognitive skills and the gender disparities in test scores and teacher assessments: Evidence from primary school. *Journal of Human Resources*, 48(1), 236–264.

<http://www.terry.uga.edu/~cornwl/research/cmvp.genderdiffs.pdf>

Using data from the 1998–1999 ECLS-K (Early Childhood Longitudinal Study – Kindergarten) cohort, the authors show that the grades awarded by teachers are not aligned with test scores.

DeWitt, P. (2014, April 29). The myth of learning styles [Web log post: *Ed Week*, Finding Common Ground].

http://blogs.edweek.org/edweek/finding_common_ground/2014/04/the_myth_of_learning_styles.html?cm_p=ENL-EU-NEWS2

The blog entry, referring to the research of Howard Gardner and that of John Hattie and Gregory Yates in their new book, *Visible Learning and the Science of How We Learn* (2014), seeks to debunk the “learning styles myth.” The author advocates a plurality of teaching approaches that personalize learning and that avoids “[boxing] students into one way of learning.”

DiPrete, T. A., & Buchmann, C. ([2014]). *The secret behind college completion: Girls, boys, and the power of eighth grade grades*. Washington, DC: Third Way.

http://content.thirdway.org/publications/813/NEXT_-_The_Secret_Behind_College_Completion.pdf

This brief, recently cited in the *New York Times*, overviews the work by DiPrete and colleagues (some listed elsewhere in the report, attributing behavioral patterns developed in early childhood and revealed in academic grades by Grade 8, as key factors in later academic success.

DiPrete, T. A., & Jennings, J. L. (2009). Social/behavioral skills and the gender gap in early educational achievement. *Social Science Research*, 41, 1–15.

http://www.columbia.edu/~tad61/gender_social02232009.pdf

According to this report’s abstract, “Analyzing data from the Early Child Longitudinal Study-Kindergarten Cohort, we demonstrate that social and behavioral skills have substantively important effects on academic outcomes from kindergarten through fifth grade. Gender differences in the acquisition of these skills, moreover, explain a considerable fraction of the gender gap in academic outcomes during early elementary school. Boys get roughly the same academic return to social and behavioral skills as their female peers, but girls begin school with more advanced social and behavioral skills and their skill advantage grows over time. While part of the effect may reflect an evaluation process that rewards students who better conform to school norms, our results imply that the acquisition of social and behavioral skills enhances learning as well. Our results call for a reconsideration of the family and school-level processes that produce gender gaps in social and behavioral skills and the advantages they confer for academic and later success.”

DiPrete, T. A., & McDaniel, A. (2011). Family, gender and educational outcomes in elementary and middle school. Paper presented at the 2011 Spring Meeting of the ISA RC28 University of Essex, UK, April 2011.

<http://paa2011.princeton.edu/papers/111673>

According to this paper’s abstract, “It is now well established that girls typically outperform boys in school and have higher levels of educational attainment. Recent research suggests that the gender gap in educational attainment is related to family resources, in that the attainment gap appears to be smaller in families with more highly educated parents. Using data from the National Longitudinal Surveys of 1979 and 1997 along with data from the ECLS-K, we provide evidence that the gender gap in educational performance at various points in the educational career is smaller in families with more highly educated parents, and that the gender gap in behavior problems – which has been linked to educational attainment in previous research – may also be smaller in these families. The presence of a biological father in the household may also be linked to the size of the gender gap in behavior problems in elementary and middle school.”

Dixon, E. (2014). 6 keys to school success. Colorado Springs, CO: Gurian Institute.

<http://gurianinstitute.com/wordpress/6-keys-to-school-success-dr-ed-dixon/>

The author claims that, if teachers and parents change how they approach the learning of boys, they can help the boys to be more successful, productive, and happier – without disadvantaging girls. Moreover, he then presents six “secrets” parents can use to profoundly affect a boy’s learning success.

Duckworth, A. L., & Seligman, M. E. P. (2006). Self-discipline gives girls the edge: Gender in self-discipline, grades, and achievement test scores. *Journal of Educational Psychology*, 98(1): 198–208.

http://www.sas.upenn.edu/~duckwort/images/publications/DuckworthSeligman_2006_GenderinDisciplin eandAchievement.pdf

This investigation suggests that one explanation for girls earning higher grades than boys in all major subjects throughout elementary, middle, and high school is that girls are more self-disciplined, and this advantage is more relevant to report card grades than to achievement or aptitude tests.

Edgette, J. (2014). Boy behavior or bad behavior? Colorado Springs, CO: Gurian Institute.

<http://gurianinstitute.com/wordpress/boy-behavior-or-bad-behavior-dr-janet-edgette/>

The author claims, “By mistaking unchecked behavior for undeveloped behavior, we allow unacceptable behavior in boys and men to be seen as just another part of ‘being a guy’.” Later in the article, she says, “Taken as a group I believe it’s fair to say that boys will always demonstrate more over-the-top, risk-taking, trash-talking behavior than will girls. But respecting the differences between genders shouldn’t mean we offer up exemptions to boys from behaving well. I can see how it might be physically or emotionally harder for a lot of young boys to keep their aggressive or competitive urges in check than it is for young girls, but it doesn’t mean we don’t ask them to do it.”

Entwisle, D. R., Alexander, K. L., & Olson, L. S. (2007). Early Schooling: The Handicap of Being Poor and Male. *Sociology of Education*, 80: 114–138.

<http://soe.sagepub.com/content/80/2/114.full.pdf+html>

What distinguishes this study from other studies of gender differences in reading comprehension is its longitudinal design, the early point from which children were followed (age 6), and the attention given to socioeconomic status differences in how parents and teachers treat boys.

Evans, K. S. (1998). Combating gender disparity in education: Guidelines for early childhood educators. *Early Childhood Education Journal*, 26(2), 83–87.

<http://link.springer.com/article/10.1023/A:1022999128728#page-1>

This article states that its purpose is to outline areas within a classroom that prospective teachers or childcare providers can update to reflect a more gender-fair environment, with suggestions for assessing classrooms for an antibiased environment.

Flam, L. (2013). Boys’ classroom behavior impacts grades, study finds. NBC News Today.

<http://www.today.com/moms/boys-classroom-behavior-impacts-grades-study-finds-1B8308131>

In this online article, the author poses the question, “When your elementary school-aged son gets in trouble for acting up in class or playing too rough with another student, you might not be surprised if the teacher keeps him in from recess. But what if acting up was hurting his math grade?”

Flurie, R. (2013) Gender differences in learning preferences? *Educational Theory and Practice*.

<http://edtheory.blogspot.com/2013/03/gender-differences-in-learning.html>

This article, by a PGY1 Pharmacotherapy Resident at the University of Maryland School of Pharmacy, concludes, “I will not be relying on stereotypes when it comes to men versus women in education. Instead, I will consider learning preferences on an individual basis and will select the most appropriate methods based on the material being taught. While some preferences in life might be heavily influenced by gender, learning style is not one of them.”

Frawley, T. (2005, Summer). Gender bias in the classroom: Current controversies and implications for teachers. *Childhood Education*. 81(4), 221–227.

<http://www.tandfonline.com/doi/pdf/10.1080/00094056.2005.10522277>

This article states that teachers must learn to recognize and eliminate gender bias, because it can limit students’ ambitions and accomplishments, and it presents a number of strategies that will help elementary teachers to reduce gender stereotypes in the classroom.

Fryer, R. G., & Levitt, S. D. (2009). An empirical analysis of the gender gap in mathematics. Working Paper 15430. Cambridge, MA: National Bureau of Economic Research.

<http://cid.bcrp.gob.pe/biblio/Papers/NBER/2009/Octubre/w15430.pdf>

In this paper, the authors document and analyze the emergence of a substantial gender gap in mathematics in the early years of schooling using a large, recent, and nationally representative panel of children in the United States.

Ghezzi, P. (2013). Boys and girls learn differently. *School Family*.

<http://www.schoolfamily.com/school-family-articles/article/10800-boys-and-girls-learn-differently>

According to this online article, “Research supports what parents of boys and girls have always known: Those brains are wired differently. Not all kids fit the pattern, but boys tend to learn better when they have pictures, graphics, and physical movement to help them grasp concepts. Girls often benefit from the opportunity to talk about how to solve a problem and work with others on a solution.”

Gurian, M., & Stevens, K. (2010). 10 essential strategies for teaching boys effectively. *ASCD Express*, 6(4).

<http://www.ascd.org/ascd-express/vol6/604-gurian.aspx>

The authors of this article claim, “A number of schools in our research base have closed gender gaps, raised student performance, and made adequate yearly progress within a year of instituting the Teaching Boys Effectively Logic Model. Among the practical strategies in which their teachers have been trained and coached, these 10 constitute both a research and performance baseline for success.”

Hedges, L. V., & Nowell, A. (1995). Sex differences in mental test scores, variability, and numbers of high-scoring individuals. *Science*, 269: 41–45.

http://worldtrackerorg.worldtracker.netdna-cdn.com/media/library/Science/Science%20Magazine/science%20magazine%201995-1996/root/data/Science%201995-1996/pdf/1995_v269_n5220/p5220_0041.pdf

This analysis of mental test scores from six studies that used national probability samples provides evidence that, although sex differences have been generally small and stable over time, the test scores of males consistently have larger variance. Except in tests of reading comprehension, perceptual speed, and associative memory, males typically outnumber females substantially among high-scoring individuals.

Jones, M. G., Howe, A., & Rua, M. J. (2000). Gender differences in students' experiences, interests, and attitudes toward science and scientists. *Science Education*, 84, 180–192.

[http://onlinelibrary.wiley.com/doi/10.1002/\(SICI\)1098-237X\(200003\)84:2%3C180::AID-SCE3%3E3.0.CO;2-X/pdf](http://onlinelibrary.wiley.com/doi/10.1002/(SICI)1098-237X(200003)84:2%3C180::AID-SCE3%3E3.0.CO;2-X/pdf)

The purpose of this study was to examine sixth-grade students' attitudes and experiences related to science. The study involved 437 students who completed a survey designed to elicit students' perceptions of science and scientists, out-of-school science experiences, science topics of interest, and characteristics of future jobs. Results showed that, for this sample, there continue to be significant gender differences in science experiences, attitudes, and perceptions of science courses and careers.

Kaufman, C. (2012). How boys and girls learn differently. *Reader's Digest*.

<http://www.rd.com/advice/how-boys-and-girls-learn-differently/>

This online article deals with the controversial idea of teaching the genders separately. It begins, “At a primary school Manning, a small town 65 miles east of Columbia, South Carolina, second grade teachers Holly Garneau and Anna Lynne Gamble are convinced that segregating elementary-age boys and girls produces immediate academic improvement—in both genders. Eager to capitalize on their past progress, the two created a teaching plan for the upcoming semester. The kids will be in a coed environment for homeroom, lunch, and recess, then divide up for four hours each day to learn their math, science, reading and social studies.”

Lau, W. W. F., & Yuen, A. H. K. (2011). Gender differences in learning styles: Nurturing a gender and style sensitive computer science classroom. *Australasian Journal of Educational Technology*, 26(7), 1090–1103.

<http://www.ascilite.org.au/ajet/ajet26/lau.pdf>

This study indicated that, in secondary school computer programming classes, females had higher preference for concrete sequential and abstract random compared with males, and males had higher preference for concrete random than did females.

Linver, M. R., Davis-Kean, P. E., & Eccles, J. S. (2004, March). The slippery slope: Predicting trajectories of males' and females' mathematics grades, interest, and self-concept in Jr. high and high school. Presented at the biennial meetings of the Society for Research on Adolescence, Baltimore, MD.

<http://www.rcgd.isr.umich.edu/garp/presentations/linver04.pdf>

This paper examines how the value and interest in math relates to academic achievement over time. They predict that subjective task value – in particular, interest in math – will be associated with math school grades over time, even after controlling for maternal education and achievement-related variables.

Magon, A. J. (2009). Gender, the brain and education: Do boys and girls learn differently? Doctoral dissertation presented at the University of Victoria, Victoria, British Columbia, Canada.

https://dspace.library.uvic.ca/bitstream/handle/1828/1411/magon_project_signatures_removed.pdf?sequence=1

The abstract of this dissertation states, “Recent discoveries of cerebral structural and functional differences between male and female brains indicate that boys and girls are wired differently for learning. These differences have significant implications for schools and pedagogy. Several gender-specific methodologies from the literature are suggested for teaching boys and girls that incorporate the scientific findings. Several of these methodologies were tested in a study, conducted at a British Columbia, private, all-girls high school. Two Science 9 classes received lessons that were designed to target either boys or girls. Results indicate that engagement and enjoyment of lessons do not always correlate to successful learning of content. In an all-girls setting, the literature strategies aimed at teaching girls produced higher achievement than those targeted to teaching boys.”

Manzanares, V. (2014). More than differentiated instruction. *Classroom Link*, 11(1).

http://pearsonclassroomlink.com/articles/0211/0211_0201.htm

According to this article, “New studies are being done to help us learn more about our students’ needs in order to reach them accordingly, and field experts have proved that boys and girls learn in a different way just because of gender.”

Marano, H. E. (2003, July/August). The new sex scorecard. *Psychology Today*, 36(4), 38–44.

<http://www.psychologytoday.com/articles/200306/the-new-sex-scorecard>

According to this article, men’s and women’s minds really do work differently – but not on everything. It claims that the latest research shows that males and females are, in fact, different from the moment of conception, and the difference shows itself in every system of body and brain, so, “It’s safe to talk about sex differences again.”

Mechtenberg, L. (2009). Cheap talk in the classroom: How biased grading at school explains gender differences in achievement, career choices and wages. *The Review of Economic Studies*, 76, 1431–1459.

<http://www2.wiwi.hu-berlin.de/institute/hns/material/Mechtenberg.pdf>

In this paper, the author attempts to demonstrate “that the consequences of biased feedback in the separating equilibrium can explain the observed differences in achievement distributions of boys and girls.”

Mickelson, R. A. (2003). Gender, Bourdieu, and the anomaly of women’s achievement redux. *Sociology of Education*, 76: 373–375.

<http://www.jstor.org/stable/1519873>

In this article by Roslyn Arlin Mickelson, the author deals with the question: Given the relatively weaker wage and status rewards for their school success, why do women continue to excel academically and obtain more educational credentials than do men?

Penner, A. M. (2008). Gender differences in extreme mathematical achievement: An international perspective on biological and social factors. *American Journal of Sociology*, 114: 138–170.

http://www.sph.umich.edu/ciahd/documents/minutes/fallWinter2009/april/penner_genderdifferencesinextrememathematicalachievement_2008.pdf

According to this paper, genetic and other biological explanations have reemerged in recent scholarship on the underrepresentation of women in mathematics and the sciences. This study engages the debate by using international data to demonstrate the importance of social factors and to estimate an upper bound for the impact of genetic factors.

Rennie, L.J. (1998). Gender equity: Toward clarification and a research direction for science teacher education. *Journal of Research in Science Teaching*, 35(8), 951–961.

[http://onlinelibrary.wiley.com/doi/10.1002/\(SICI\)1098-2736\(199810\)35:8%3C951::AID-TEA8%3E3.0.CO;2-T/pdf](http://onlinelibrary.wiley.com/doi/10.1002/(SICI)1098-2736(199810)35:8%3C951::AID-TEA8%3E3.0.CO;2-T/pdf)

The author comments on three issues of concern to him: that there is a need to recognize difference in the meaning and the use of the terms *sex* and *gender*; that trying to ensure that science methods classes are gender inclusive and that their members are committed to gender equality is a difficult and risky business; and that, if changing gendered practice is so difficult, why do we want to try, and how should we go about it?

Sadker, D. (1999). Gender equity: Still knocking at the classroom door. *Educational Leadership*, 33(1), 80–83.

<http://www.tandfonline.com/doi/pdf/10.1080/1066568000330112>

The author states that many educators are confused about gender equity, asking such questions as: Is it still a problem? Is it more political correctness than educational effectiveness? Wasn’t the battle fought and won years ago? The article includes The Top Ten Gender Bias Updates.

Severiens, S. E., & Ten Dam, G. T. M. (1994). Gender differences in learning styles: A narrative review and quantitative meta-analysis. *Higher Education*, 27, 487–501.

<http://dare.uva.nl/document/44652>

This article reviews research on gender and learning styles of students, 18 and older, conducted after 1980. Lynn Curry's onion model is used to classify definitions of learning styles and to reconstruct the theoretical frameworks used. The extent to which learning style is considered stable or variable in different learning contexts determines its position in the model. Most studies used theoretical frameworks that belonged in the middle or outer layers of the model. This location indicates the strong influence of learning contexts on women's and men's learning styles. While there were differences between learning styles, research designs rarely included learning contexts.

Severiens, S. E., & Ten Dam, G. T. M. (1997). Gender and gender identity differences in learning styles. *Educational Psychology*, 17, 79–93.

<http://dare.uva.nl/document/44649>

Extensive research on gender and learning styles has produced a multitude of findings: gender differences in learning styles are small on average, but across studies quite different results are observed. This heterogeneity is the central focus of this study. Two possible interpretations concerning the educational context and the concept of gender identity are investigated: the teacher and the subject he or she teaches.

Sommers, C. H. (2000, May). The War Against Boys. *The Atlantic Online*. Washington, DC: The Atlantic Monthly Group.

<http://www.theatlantic.com/magazine/archive/2000/05/the-war-against-boys/304659/>

This online article begins, “This we think we know: American schools favor boys and grind down girls. The truth is the very opposite. By virtually every measure, girls are thriving in school; it is boys who are the second sex.”

Spelke, E. S. (2005). Sex differences in intrinsic aptitude for mathematics and science? *American Psychologist*, 60(9), 950–958.

<http://www.wjh.harvard.edu/~lds/pdfs/spelke2005.pdf>

This article considers three claims that cognitive sex differences account for the differential representation of men and women in high-level careers in math and science, and claims research on cognitive development in human infants, preschool children, and students at all levels provides evidence that that mathematical and scientific reasoning develop from a set of biologically based cognitive capacities that males and females share, capacities leading men and women to develop equal talent for mathematics and science.

Torske, J. R. (2011). Differentiating instruction with regard to gender and learning style in a biology class. Doctoral dissertation presented at Montana State University, Bozeman, MT.

<http://scholarworks.montana.edu/xmlui/bitstream/handle/1/2434/TorskeJ0811.pdf?sequence=1>

In this investigation, daily lessons, assignments, labs, lectures, and assessments were differentiated with regard to both gender and learning style preference to determine the effect on student in-class performance and classroom dynamics. Males and females were shown to prefer different learning modalities, and in-class performance varied with the differentiation technique employed.

Voyer, D., & Voyer, S. D. (2014, April 28). Gender differences in scholastic achievement: A meta-analysis. *Psychological Bulletin*. Advance online publication.

<http://www.apa.org/pubs/journals/releases/bul-a0036620.pdf>

This meta-analysis of studies from over 30 countries spanning publications dates from 1914 to 2011 finds that girls' grades in school, as opposed to scores on achievement tests, are consistently higher than those of boys in all subjects. The advantage girls held over boys was greatest in language classes, smallest in mathematics courses. Citing a number of previous studies by others, the authors offer "several plausible explanations [that] align with the overall effect in school marks," including sociocultural factors; learning styles (i.e., mastery vs. performance, for which, they note, the evidence is contradictory); biological influences underlying gender differences in activity levels, which in turn could "affect teachers' subjective perceptions of students." In addition, the findings suggest "that boys have been lagging for a long time and that this is a fairly stable phenomenon," thus disputing claims of a recent "boy crisis" in education; it is "a long-standing issue rather than a recent phenomenon."

Zamosky, L. (2012). How boys and girls learn differently. *WebMD*.

<http://www.webmd.com/parenting/features/how-boys-and-girls-learn-differently>

According to this online article, "Studies show that boys learn differently than girls. Brain scans tell part of the story. In general, more areas of girls' brains, including the cerebral cortex (responsible for memory, attention, thought, and language) are dedicated to verbal functions. The hippocampus – a region of the brain critical to verbal memory storage – develops earlier for girls and is larger in women than in men.